Evaluation of the Red Cross Volunteer Program in Kep District, Cambodia

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1 Executive Summary

Background: The Red Cross Volunteer (RCV) Program in Kep is an ambitious community participation program with components of community-based first aid, health education, referral to the health centres and referral hospital, and community-based surveillance system (CBSS). Through Cambodian Red Cross' creation and the Centre for International Health's evaluation of this project, both organizations are striving to support the Operational District and the Ministry of Health as part of their respective Primary Health Care projects.

Study: The study comprised qualitative and quantitative parts. Individual interviews and focus groups were conducted to assess the experience and the knowledge of the RCVs. Data collected by the CBSS was analyzed for trends and validity through comparisons with existing data from national sources and facility-based surveillance (FBS). The location of the study was two communes in Kep, each serviced by a health centre.

Results: The responses given by the RCVs varied widely with respect to the logistics of doing home visits for CBSS. Their level of knowledge varied from topic to topic, being especially weak on acute respiratory infections. Of the two quantitative comparisons, the comparison against was more useful. However, both demonstrated that diarrhea and ARI are underreported by RCVs in CBS. The comparison with FBS data was done by commune, and both communes showed the same pattern.

Discussion: Limitations to the comparisons included small population size, small number of data points available, and comparison of data from different time points. However, some of the differences observed were too stark to be ignored and corroborated by all components of the study. For example, it is obvious that RCVs are not detecting cases of ARI. A possible reason for this is their low knowledge about these illnesses. Some similarities were also very obvious. For instance, the CBS and FBS reported virtually the same number of births over the months of comparison. Therefore despite the limitations, some key observations were made.

Recommendations: The capacity of the RCV program could be increased by training more people to be RCVs, training the RCVs more extensively, and compensating them more. If this is not feasible, the RC could streamline the program so that the RCVs can focus more time and energy on fewer tasks. Finally, the RCV program would be more reliable if more standards were put in place, especially with respect to the logistics of doing home visits.

2 Acknowledgements

This project could only be described as a team effort. Firstly, I'd like to thank Dr. David Zakus and the Centre for International Health for giving me this incredible learning opportunity. My supervisors, Dr. Shiv Grewal and Ann Lovold have been instrumental with their leadership and guidance, supporting me both professionally and personally. None of this research would have been possible without a great team of translators: Chantha Gnim, Kunthy Ok, Rath, and above all, the inimitable Bunthoeun Thon. Finally, thanks to my peers and

classmates in Kep for their commitment to the cause, their sense of humour, and their special friendships that I will cherish long after this is all over.

3 Relevant Background

3.1 Cambodia

In Cambodia, the effects of the brutal Khmer Rouge regime are still being felt today. A generation was decimated, destroying families, robbing the country of precious human resources, and stunting the development of all sectors. One such sector is health, where Cambodia's poor health indicators illustrate the extent of the damage. For instance, amongst countries in the WHO Western Pacific Region, Cambodia ranks last and second last in life expectancy at birth for both males and females, respectively (WHO, Core Health Indicators). Life expectancy at birth is 54.6 years and health system performance ranks 174th out of 191 countries (WHO, The World Health Report, 2004; WHO, The World Health Report, 2000). The poor health status of the population is most pronounced in underresourced settings such as Kep province.

3.2 Kep

Kep is a small, sparsely populated, rural province on the south western coast of Cambodia. The principal activities are farming, fishing, and catering to tourists along the beach. The area is divided into three communes, Okrasar, Pong Toek, and Ang Koul, each comprising multiple villages. Kep is served by three health clinics corresponding to the communes, and one referral hospital. These facilities are underused for several (interrelated) reasons.

3.3 Health System Utilization

Firstly, there is low capacity in the staff and service provision. While many of the staff have gone through training programs, many lack practical experience. Their salaries from the Provincial Health Department are meagre and require them to work second jobs during the afternoons in order to provide for their families. This includes private practice from their homes and within their communities. Furthermore, the low compensation limits the amount of community outreach that health care workers are able and willing to do, since their transportation costs are not covered. The service provision is constrained not only by the capacity of the health care workers but also by the limited range of medications and equipment available. For instance, paracetamol and acetylsalicylic acid are the strongest analgesics available. Many villagers are aware of these shortcomings and hence, stay away from the clinics.

Secondly, a large proportion of villagers cannot or will not go to the health centres when they require care. One major issue is that of transportation. The available modes of transportation are by moto, by bicycle or on foot. There are limitations to each, including cost, proximity, and condition of the patient. Therefore, many opt to visit private pharmacies, clinics, or traditional healers who live nearby and charge less than the cost of hiring a moto and paying the user fee at the health centre. Other reasons for choosing health services outside of the public system are based on beliefs. For instance, many families

have relied on traditional healers, the Kru Boran, and traditional birth attendants (TBAs) for generations and see no reason to change. There is also the belief that receiving medication by injection is superior to the oral route. Since the health centres do not use injections outside of immunization purposes, some people prefer to go to a private pharmacist or clinic to have paracetamol injected. Therefore, villagers have constraints and beliefs that keep them away from the health centres.

4 Specific Background

The Cambodian Red Cross has tried to address these issues since it became involved in Kep province in 2000. In particular, the Red Cross Volunteer (RCV) Program was established in May 2003 in two communes, Okrasar and Pong Toek. This program supports the Ministry of Health by increasing the capacity for community participation, which is institutionalized as a component of the MoH PHC plan and which has been implemented as Village Health Support Groups or Village Health Volunteers in the past. The purpose of the RCV program is multi-faceted, with the ultimate goal of improving the health status of the communities. One aim is to have a community-based surveillance system (CBSS), wherein the RCVs monitor the incidence of certain health indicators in their communities such as births, deaths, and illnesses specified by the Red Cross (see Table 1). Every month, the RCVs submit their data at the monthly meeting at the CRC office. Another is for health education to improve villagers' knowledge about basic hygiene and sanitation, disease prevention, and disease symptoms. Also, the RCVs received first aid training with the purpose of treating minor injuries in the community. Finally, by monitoring illnesses, RCV should make referrals to the health centres or referral hospital when necessary.

In each village, a group of volunteers was chosen based on a volunteer to population ratio of 1:100. This amounts to 10 RCVs in Okrasar, and 16 in Pong Toek (see Table 2 for breakdown) communes. The volunteers were trained in the CBSS, specific diseases, and first aid. RCVs were trained in CBSS by the Primary Health Care Team (PHCT) in conjunction with the provincial health department (PHD) and the ministry of health (MoH) from June 9-13, 2003 (8 business days). Community-based first aid training was conducted by the Red Cross, and each complete session lasted five days. Training about specific health education topics occurred at the monthly meetings; the schedule is outlined in Table 3. They received first aid materials, ORS therapy for diarrhea, cloth health education flipcharts, posters and leaflets for distribution, a T-shirt, and a bicycle. Initially, RCVs received compensation in the form of per diems in the amount of $2USD monthly and an additional $1USD for attending the monthly meeting. However, these amounts have since increased slightly.

CBSS Data Categories
No. births
No. deaths (<5)
Total deaths
Diarrhea

Acute Respiratory Infections (ARI)
Malaria
Dengue
Tuberculosis
Measles

Table 1. Health indicators reported monthly by the RCVs to the Red Cross.

Commune	Village	Population	No. RCVs
Okrasar	OS	679	5
	DC	572	5
Pong Toek	PL	418	5
	CB	493	5
	OD	248	2
	RN	164	2
	PK	188	2

Table 2. Breakdown of RCVs by village and commune. RCV numbers are based loosely on a RCV to population ratio of 1:100.

Month	Topic
July	Vaccination Measles
August	Dengue Haemorrhagic Fever
September	Tuberculosis
October	Malaria
November	Typhoid Fever
December	HIV/AIDS

Table 3. Health Education Topics in which RCVs received training in 2003 at the monthly meeting.

5 RATIONALE/PURPOSE FOR STUDY

- RCV have many responsibilities

The Annual Report on the Primary Health Care Project in Kep released by the Cambodian Red Cross in April 2004 describes the genesis and implementation of the program and outlines the achievements that have been made. Now that the program has marked its one year anniversary, there is enough data from the CBSS for analysis. This includes not only the analysis of epidemiological trends but also the analysis of the validity of the data. Consequently, the value of the CBSS within the RCV program will be determined. Also, this is an opportunity to identify the strengths and weaknesses of the program, based on the outcomes to date and the experiences reported by the RCVs. This is especially important because the breadth of the RCV program creates many expectations of and responsibilities for the RCVs. Following the evaluation of the program, recommendations can be made for its improvement.

6 METHODS

To accomplish the goals set above, both qualitative and quantitative methods were employed. To assess the experience of the RCVs, individual interviews and focus groups were conducted. Important indicators include the time commitment made by RCVs, their knowledge base and hence their capacity to perform CBSS, health education, and first aid.

6.1 QUALITATIVE

All interviews and focus groups with RCVs were arranged through the health centre directors at OS and PT. Of 26 RCVs, each of 20 participated in either an individual interview or a focus group (see Table 4). Reasons for not participating were usually related to work on the farm. Verbal consent was obtained from each participant on the condition of confidentiality. All participants were given a per diem of $1USD for their time. Generally, interviews lasted one hour, and focus groups 1.5 hours. All investigations but one interview were conducted at the health centre.

Commune	Village	Total volunteers	No. interview participants	PT Focus group	OS Focus group
Okrasar	OS	5	0	-	3
	DC	5	2	-	3
Pong Toek	PL	5	3	0	-
	CB	5	2	1	-
	OD	2	1	1	-
	RN	2	1	1	-
	PK	2	1	1	-
Subtotal		-	10	4	6
Total		26	20		

Table 4. Breakdown of Participating Volunteers by Village and Commune.

Individual interviews were conducted with RCVs from every village except OS. The main components of the interview were demographics, time commitment and logistics of doing community-based surveillance, and knowledge level and retention for CBS data categories.

In each commune, one focus group was conducted. The size of the focus group was not predetermined and depended on how many volunteers wished to come. For instance, eight RCVs were invited for the PT focus group, with the knowledge that some would not come. Ultimately, only four RCVs came to the HC that morning. On the other hand, six RCVs from OS were invited and everyone accepted. An attempt was made to have representation from all villages to facilitate the discussion of different ideas and experiences.

Another source of data was the cloth health education flipchart. This was borrowed from the health centre and interpreted by a translator. Each page of the flip chart contained teaching on a particular topic, and was principally pictorial.

This portion of the study is not amenable to quantitative analysis because of the small sample size and the nature of the questions asked.

However, the knowledge, experience, and ideas of the RCVs will be a valuable tool for understanding the quantitative data that they collected.

6.2 Quantitative

6.2.1 Data Source: CBSS

RCV data was collected from the Cambodia Red Cross in Kep and Phnom Penh. However, not all of the existing data months were available (see Table 5), and the data for May and June 2003 were combined. The same population figures were repeated throughout the months despite the collection of birth and mortality data (see Table 1). Following data entry, the data was analysed across time and between villages to understand the epidemiological profile. To appreciate the validity of the RCV CBSS, the CBSS data was compared with existing data.

Year	Month(s)	Status of Data
2003	May/June	Received
	July	Received
	August	Received
	September	Received
	October	Missing
	November	Missing
	December	Received
2004	January	Received
	February	Received
	March	Received
	April	Received
	May	Missing
	June	Received

Table 5. Availability of CBSS data from the Red Cross.

6.2.2 Data Source: Existing Figures for Comparison to CBSS

The sources of existing data were facility-based surveillance and national data. In facility-based surveillance or FBS, health care workers keep track of various data every month, including vaccination coverage, deliveries at the HC and in the community, and the number and types of cases that present at each health centre. Since these data are collected from the same communes as the Red Cross community-based surveillance (CBS), the two sets of data can be compared directly. Moreover, the FBS data are likely to be accurate, given that they were recorded by health care workers; those staff making diagnoses have around three years of training (describe amount of training for RCVs above). However, the data may be an underestimate of the true number of cases, since the majority represents patients that visited the health centre. Nevertheless, the FBS data represent a baseline of data against which the CBS data can be validated.

6.2.2.1 Selection and Modification of FBS Data Categories

Whenever possible, FBS data from categories approximating the Red Cross CBS categories were obtained, resulting in seven categories for

comparison (see Table 6). The FBS data on births is normally sub-categorized into deliveries at the HC, at home but with HC staff, and with TBA only. The FBS data on ARI is sub-categorized by location, high and low representing upper and lower. In these cases, the data from the sub-categories was totaled, resulting in the modified FBS categories "total deliveries" and "total ARI". Furthermore, the closest approximation of a tuberculosis data category at the HC was "cough for more than 21 days". From Okrasa HC, data was obtained from January to May 2004, while at Pong Toek HC, data from January to June 2004 was available. Since there was no available CBS data for May 2004, that month of FBS data was omitted from the comparison. For each category, data was totaled over the months used.

Original FBS categories	Modified FBS categories	CBS categories
• *No. deliveries at HC* • *No. delieveries at home (by HC staff)* • *Deliveries attended by TBA (only)*	*Total Deliveries*	*No. births*
Diarrhea	Diarrhea	Diarrhea
• *High ARI* • *Low ARI*	*Total ARI*	*ARI*
Malaria	Malaria	Malaria
Dengue	Dengue	Dengue
Cough > 21d	*Cough > 21d*	*Tuberculosis*
Measles	Measles	Measles

Table 6. FBS and CBS data categories used for comparison. Italicized categories represent those in which the FBS categories were modified or there was an inexact match between FBS and CBS.

More generally, CBS data was compared with national data obtained from the WHO. Most often these data are not decomposed into rural and urban categories; hence they are far less specific than the FBS data. Since rural health indicators often differ from urban ones, these data provide a less effective basis for comparison than the FBS data.

7 Results

7.1 From interviews

In the interviews and focus groups conducted, RCVs were asked logistical questions regarding the collection of data. The responses varied greatly, suggesting that CBSS is being implemented differently across the villages. Inconsistencies even arose amongst answers given by RCVs from the same village. Especially problematic were questions that required RCVs to make estimates about demographics, duration, or frequency.

7.1.1 Assistants to the Red Cross Volunteers

One commonality was the existence of assistants to the RCVs who are appointed by the village chiefs. These assistants have no training from the Red

Cross and do not receive any per diem. Seven of nine RCVs reported that there are 3 shared assistants in their village. Some stated that the assistants live far from them, increasing the coverage of the Red Cross and reducing the workload of the volunteer. For instance, assistants report new cases from their area that the RCV might otherwise miss due to time and distance constraints. Both focus groups agreed that it would be beneficial to train these assistants to become RCVs.

Common ways of case discovery included reports from neighbours and assistants as well as visits to every home. Word of mouth of illness from neighbours leads to RCV home visits. On the other hand, assistant reports of illness are not always followed up by a home visit by the RCV. Of the three methods, doing visits to every home is the most time-consuming, but with the right implementation, also the most sensitive for CBSS case discovery.

7.1.2 Home Visits Team

The composition of the home visits team varied from volunteer to volunteer. Responses included the RCV only, the RCV with accompanying assistants, a team of RCVs with or without assistants, or the assistant(s) only. Accordingly, each option is associated with a different level of training and time requirement. Both focus groups reached a consensus that visiting homes as a team of RCVs was the best option, despite also being the most time-consuming, because it allowed them to share ideas with one another. This may reflect insecurity about their level or retention of knowledge, or knowledge gaps that need to be addressed with further training.

7.1.3 Frequency of Home Visits

One parameter to consider in the implementation of visits to every home is the frequency of the visits. The RCVs were asked to estimate the number of occasions in month that they did home visits and their responses ranged from zero to ten (reported as two to three times per week). The RCV who answered zero reported that she had no time to do any home visits and thus delegated all visits to her assistants. Furthermore, these assistants visited homes only when they found out that someone was ill. Therefore it is possible that some homes in her village (PK) have never been visited.

At the other end of the team spectrum, visiting homes with the full RCV team from the village also reduces the throughput of the home visits. For instance, the two RCVs from DC who participated in individual interviews reported that between 15 and 30 homes are visited by the whole team per month. Both RCVs affirmed that the data submitted to the Red Cross represented only cases from the homes that were visited. This is in contrast with what the RCVs believed should happen: both focus groups agreed that each home should be visited at least once a month.

One possible consequence of infrequent home visits is that villagers' ability to recall resolved illnesses may diminish with time. The RCVs were asked whether or not a family would recall a child having diarrhea in the previous week. Half of the RCVs thought that the family would not remember to report that case of diarrhea to them.

7.1.4 Health Education

Most RCVs reported conducting health education for the villagers once a month. However, the actual number of days spent doing health education ranged from one to nine. The volunteers explained that some villages are divided into regions, and the same session is repeated once in each region each month.

While the RCVs have been trained to do health education to groups of villagers, their preference is instead to teach in the villagers' homes. In the focus groups, the RCVs stated that this medium is more effective and in addition, allows them to inspect the condition of the villagers' homes. For instance, they can determine if a family uses mosquito nets and boils water. Again, they were fully aware that doing health education home by home is more labour-intensive and less time-effective.

7.1.5 Modes and Cost of Transportation

To visit villagers' homes, three modes of transportation were available to the RCVs: by foot, by bicycle provided by the Red Cross, and by personal moto. Two RCVs chose to travel by moto and reported spending 10000r ($2.5USD) or $3USD on diesel per month. The remaining RCVs walked in addition to cycling, as oftentimes the terrain made it impossible to cycle exclusively.

7.1.6 Cards Distributed by the Red Cross Volunteers

The RCVs have cards which are used for villager referrals to the HC. Only one RCV specifically mentioned the referral cards without being asked, and more than one RCV was confused about the actual purpose of the cards.

7.1.7 RCV Communication with traditional healers and birth attendants

The traditional healers and birth attendants are a possible resource for the RCVs since they see many of the villagers who are ill or pregnant. When asked, all RCVs stated that they visit health care providers who work outside of the public system. Seven RCVs specifically stated that they obtain data about births from the TBAs; however, no RCVs obtain data from the traditional healers. In the focus groups, the RCVs stated that the traditional healers are secretive and do not share any information about their patients.

7.1.8 Knowledge of Red Cross Volunteers

As with other components of the interviews, there was a great deal of variation in the level of knowledge amongst RCVs and between topics.

7.1.8.1 Knowledge Questions Answered Well

Generally, questions relating to diarrhea were well answered, including the minimum number of loose stools in a day and the use of ORS for treatment. Nearly all RCVs correctly identified that mosquitos are the vector for malaria and dengue fever. Seven out of ten RCVs indentified both rash and fever as symptoms of dengue; amongst these, all who were asked correctly stated that the rash tends to follow the fever. Tuberculosis transmission was another strength in the RCVs' knowledge. Most recognized that contact with a TB patient, particularly with coughing or spit, could spread TB.

7.1.8.2 Knowledge Questions Answered Poorly

The most glaring gap in knowledge was with respect to acute respiratory infections (ARIs). Most RCVs were unfamiliar with what ARIs are, how they are transmitted, and what symptoms arise. This weakness is reflected in the case reporting of ARIs discussed below. While the RCVs were familiar with TB transmission, only three of ten recalled that the number of days of cough after which TB should be suspected is 21.

Measles was the other category where knowledge was weak. With respect to transmission, one of ten RCVs stated that if one family member had it, the others were likely to catch it. On the other hand, the other RCVs did not know the method of transmission. When asked about symptoms, one RCV identified all of fever, rash, and red eyes; five could name two; and three could think of one.

7.1.8.3 Areas of Knowledge beyond the Scope of RCV Training

To identify possible areas for future training, the RCVs were asked questions assessing knowledge that was not covered in their training. As expected, the RCVs had difficulty with these questions. For instance, they were not aware that diarrhea with associated fever and blood in the stool was worse than diarrhea alone. It might also be valuable to emphasize that babies younger than six months should be breastfed exclusively, and that for them, breast milk is superior to ORS in the case of diarrhea.

The symptoms of the illnesses for which the RCVs have received training are often non-specific, such as fever and rash. Therefore, the RCVs were asked if they could identify the differences between dengue fever and malaria, and between the rash in dengue and in measles. This is another possible area for further training.

There was some confusion about dengue. When asked if dengue is more severe in adults or in children, most correctly stated that it was worse in children. However, when asked for their reasoning, the RCVs stated that they had learned that only children are susceptible in dengue. This is a point that requires clarification. Also, three of ten RCVs were able to identify bleeding as the worst possible symptom of dengue, indicating dengue haemorrhagic fever.

7.2 CBSS

For the non-birth, non-mortality data categories, it is not clear whether the RCVs recorded only new cases or all cases. This casts doubt on whether the data represents prevalence or incidence. To be comparable to existing data, each data category was classified as one or the other based on the degree of chronicity (see Table 7). Data categories for shorter-course illnesses likely to resolve within a month were considered to be incidence values.

Data Category	Incidence(I)/ Prevalence(P)
*No. births**	*I*
*No. deaths (<5)**	*I*
*Total deaths**	*I*
Diarrhea	I

Acute Respiratory Infections (ARI)	I
Malaria	I
Dengue	I
Tuberculosis	P
Measles	I

Table 7. Classification of Data Categories as Incidence or Prevalence. *Not typically considered in terms of incidence or prevalence, but included here for completeness.

7.3 General CBSS Observations by Category (incl. comparison w/ national figures when available) maybe work this into the FBS and CBS comparison completely.

7.3.1 Birth Rate

A crude measure of birth rate was obtained by dividing the number of births by the population. This birth rate may include stillbirths which were not differentiated from live births. However, three RCV specifically stated either that they only classified stillbirths as a death under 5 years or that they received only data on live births from TBAs. Over the ten timepoints with data, the birth rate was 112 per 1000, with a range of 69 to 136 amongst individual villages. When the data was normalized to one year, the birth rate was 134, with a range of 82 to 163 amongst individual villages (see Figure 1). This is much higher than national figures. In 2000, the crude birth rate (number of live births in a year over the midyear population) was 27.7 (WPRO).

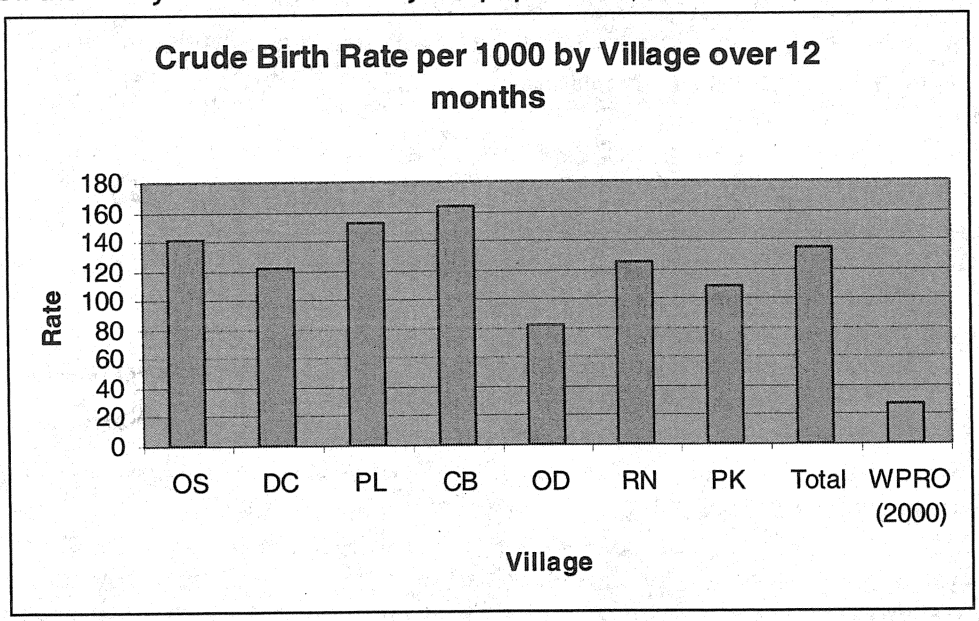

Figure 1.

7.3.2 Mortality Rate

A crude measure of mortality rate was obtained by dividing the total number of deaths by the population. This mortality rate includes child mortality which is also a separate category. Over the ten time-points with

data, the mortality rate was 24 per 1000, with a range of 16 to 35 amongst individual villages. When the data was normalized to one year, the mortality rate was 29, with a range of 19 to 42 amongst individual villages (see Figure 2). This is much higher than national figures. In 2001, the crude mortality rate (number of deaths in a year over the midyear population) was 9.7 (WPRO).

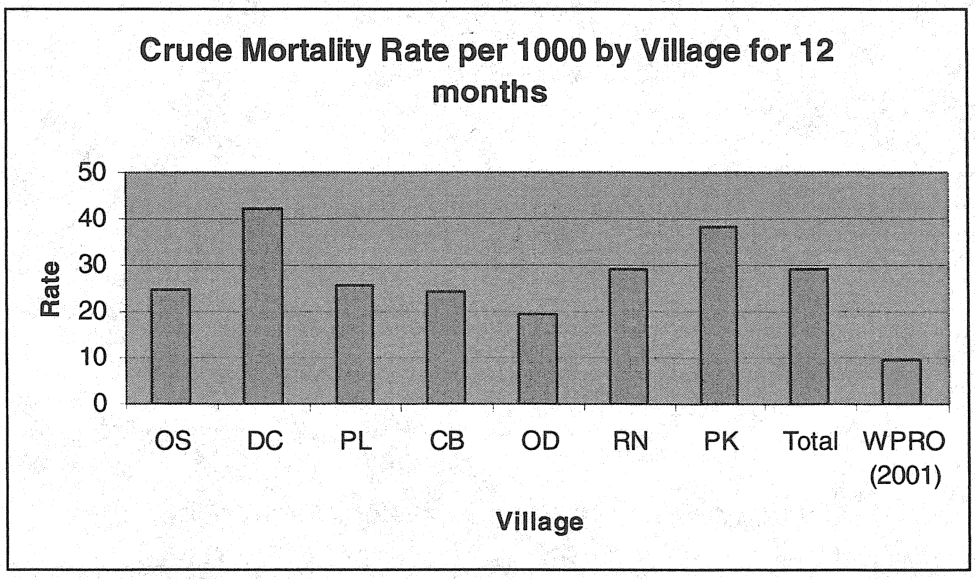

Figure 2.

7.3.3 Mortality Rate of Children under 5 Years of Age

A crude measure of child mortality under five years of age was obtained by dividing the number of deaths of children under five years by the number of births occurring in the same year. Again, the births may include stillbirths that were not differentiated from live births. Over the ten time-points with data, the child mortality rate was 65 per 1000, with a range of 30 to 176 amongst individual villages. When the data was normalized to one year, the child mortality rate was 78, with a range of 36 to 212 amongst individual villages (see Figure 3). In 2000, the child mortality rate was 124 per 1000 live births (WPRO). This falls within the range of rates found in the villages.

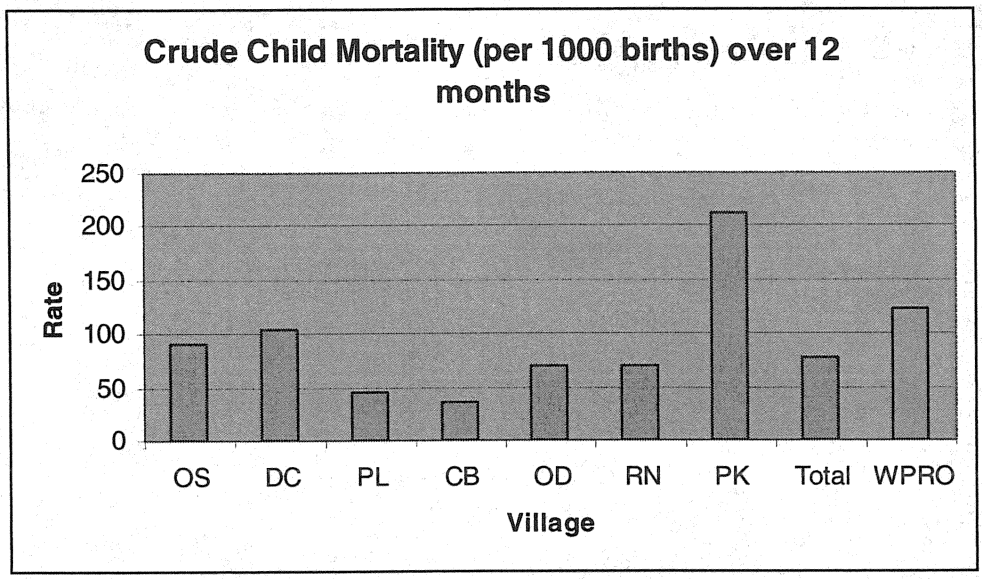

Figure 3.

7.3.4 Diarrhea

The reported incidence rates of diarrhea were consistently low throughout the year (Figure 4). Three of the seven villages (CB, PL, OD) reported no cases of diarrhea over the ten months for which data was obtained. The remaining villages reported cases of diarrhea, but only in one month each, and with an incidence rate of no more than 600 per 100,000 over the ten months. In absolute terms, six cases of diarrhea were reported from the seven villages over ten months. When normalized over twelve months, the village with the highest incidence was RN with 732 cases per 100,000 people. This remains much lower than the national incidence rate of 2366. When asked if villagers would be likely to recall cases of diarrhea that occur between RCV home visits, three of eight said no. When asked if they ask specifically about diarrhea, all but one RCV said yes. However, they may have been trying to please the interviewer.

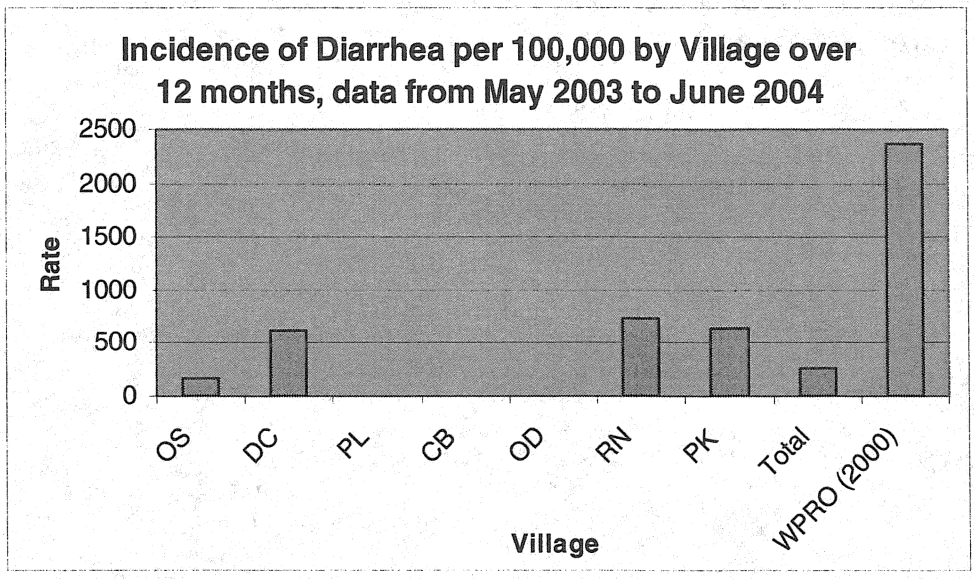

Figure 4.

7.3.5 ARI

Similarly, two villages (OS, OD) reported no cases of ARIs over the ten months (Figure 5). Of the remaining villages, only one, RN, reported ARI cases in more than one month. For the villages that reported ARI, Incidence rates ranged from 487 to 2553 per 100,000 people. The highest monthly incidence rate of ARI was in PK, where it was 2128 in July 2003. The WPRO incidence rate for ARI in 2000 was higher, at 7182.27 per 100,000.

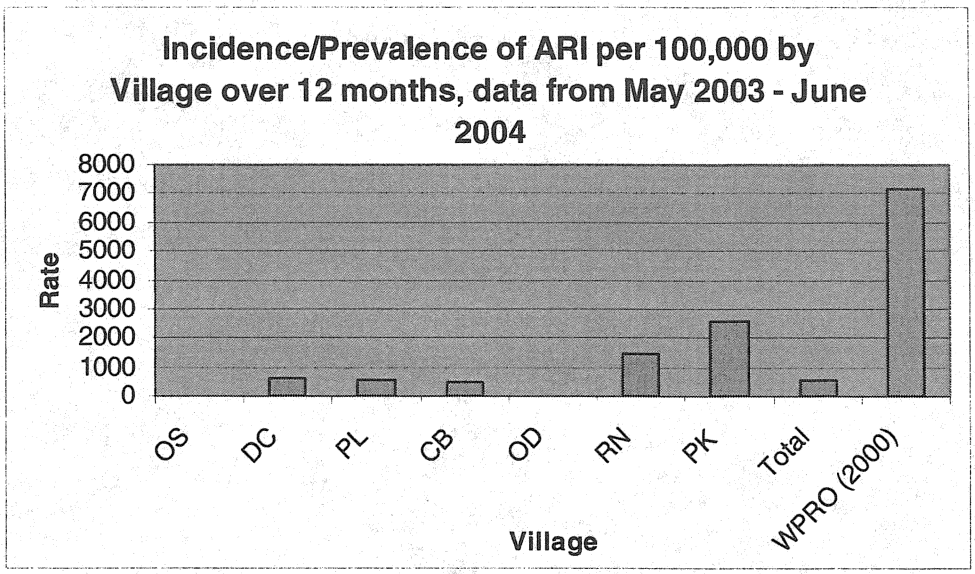

Figure 5.

7.3.6 Malaria

In all but one village, OS, RCVs reported cases of malaria over the ten months of data (Figure 6). Per 100,000, incidence rates ranged from 861 to 5598 and the rate for all villages was 2085 when normalized over 12 months.

This was higher than the national rate of 987.7 reported in 2000. Four villages had higher and three had lower incidence rates than the national average.

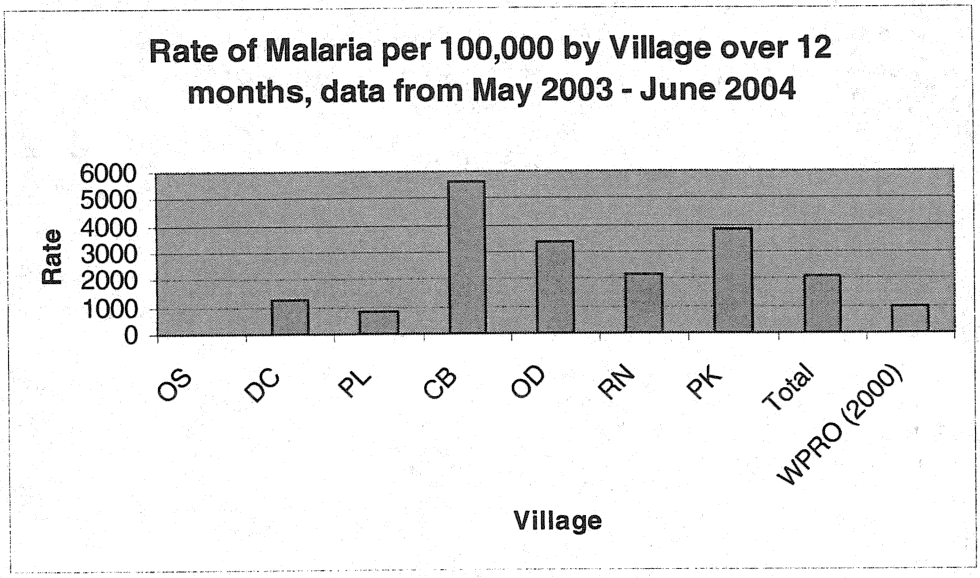

Figure 6.

7.3.7 Dengue

Four villages reported no cases of dengue or dengue haemorrhagic fever. The remaining three, OS, DC, RN, had normalized incidence rates of 177, 2517, and 2195 per 100,000 respectively (Figure 7). For all the villages, the incidence was 695. This is high compared to the national incidence rate of 24.

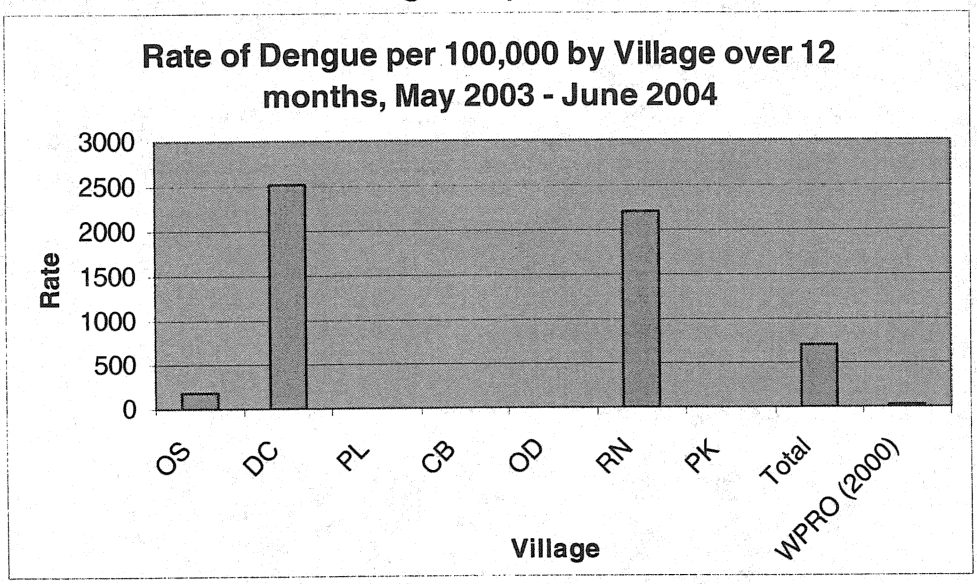

Figure 7.

7.3.8 Tuberculosis

Data for TB was analysed by month rather than by village because they approximate prevalence rather than incidence (see Figure 8). Per 100,000 people, the prevalence rate ranged from 1159 to 2209 over the period of May

2003 to June 2004 and averaged 1713. In 2000, the WHO reported the yearly prevalence of TB in Cambodia as 743 per 100,000.

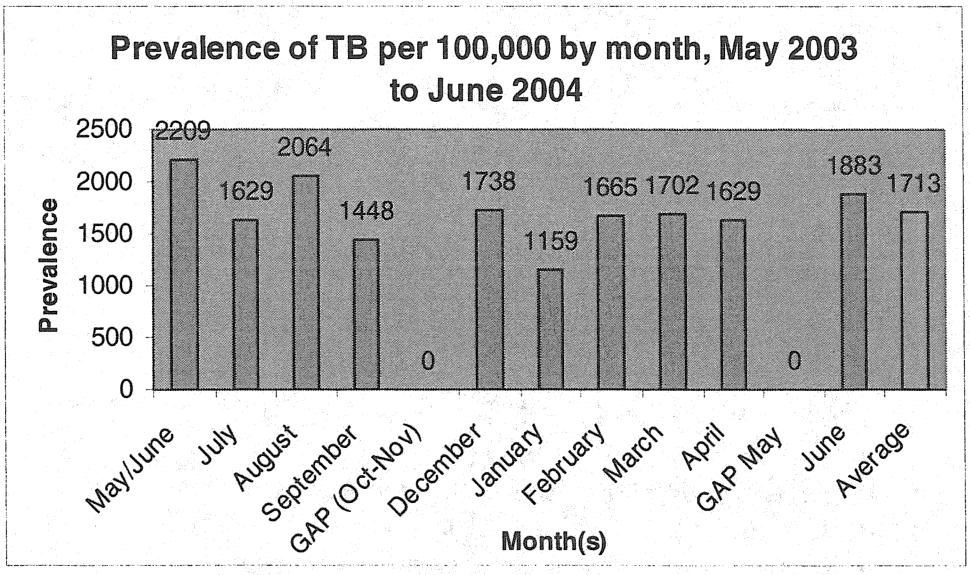

Figure 8. No data was available for GAP months. Data values are rounded.

7.3.9 Measles

Measles has been a CBSS category only since February 2004, so the amount of data available is limited. No more than one case of measles was reported in any one month, and only two cases were reported overall, one each in OD and RN (Figure 9). The incidence rate for all the villages was nearly 174, compared to the national incidence of 29.96 in 2000.

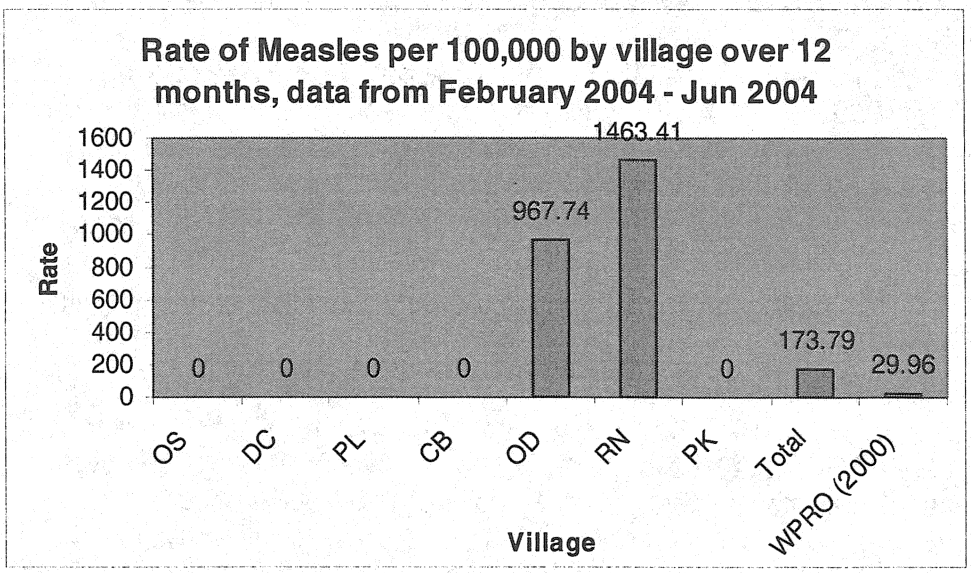

Figure 9.

Category	CBS	WPRO
Birth Rate	134.251	27.7

Mortality Rate	29.1093	9.7
Child Mortality	77.6699	124
Diarrhea	260.681	2366
ARI	564.808	7182.27
Malaria	2085.45	987.7
Dengue	695.148	24.0315
Measles	173.787	29.96

Table 8. Summary of incidence comparison: CBS vs. WPRO (WHO).

7.4 Validity of CBSS: Comparison of Facility-based and Community-based Surveillance

This comparison revealed similar situations in Okrasar and Pong Toek communes (see Figure 10, Figure 11).

7.4.1 Categories where FBS and CBS data were similar: no. births, dengue, measles

The number of births recorded by FBS and CBS were very similar. In Okrasar, there were 44 births according to FBS and 49 according to CBS from January to April. Similarly in Pong Toek, there were 69 births by FBS and 60 by CBS from January to April and June.

Dengue fever was nearly non-existent in FBS and CBS over the months compared. Generally, dengue incidence is low in rural areas because the Aedes mosquito vector is more commonly found in densely-populated urban areas (MDTravel Health, CDC).

Similarly, the number of measles cases were also few, with only 2 cases reported by CBS in Pong Toek, none by FBS in Pong Toek, and none in Okrasar. While the difference in case number may be too small to be significant, the distribution of the cases in CBS corroborates with the Khmer practice of keeping children with measles at home during the period of rash, such that few cases present to health facilities (Nandy *et al.*, 2003).

7.4.2 Categories of difference between FBS and CBS: Diarrhea, ARI, Malaria, Tuberculosis

Diarrhea was substantially underreported by CBS (zero cases) in relation to FBS (at least 66 cases). This could be attributed to the infrequency of the home visits by the RCVs. As stated previously, homes were often visited less than once a month, and many RCVs thought that villager recall of resolved cases of diarrhea might be low. Furthermore, few RCVs asked specifically if there has been any diarrhea in the household, instead asking more generally if there has been any illness.

The most staggering difference in the FBS and CBS was the number of ARI cases reported, with FBS reporting in the hundreds and CBS reporting at zero. As discussed before, ARIs were the area of poorest

knowledge for the RCVs. Like ARI, more cases of malaria were reported by FBS than CBS. On the other hand, tuberculosis or cough for more than 21 days was the only category in which CBS cases far outpaced FBS cases.

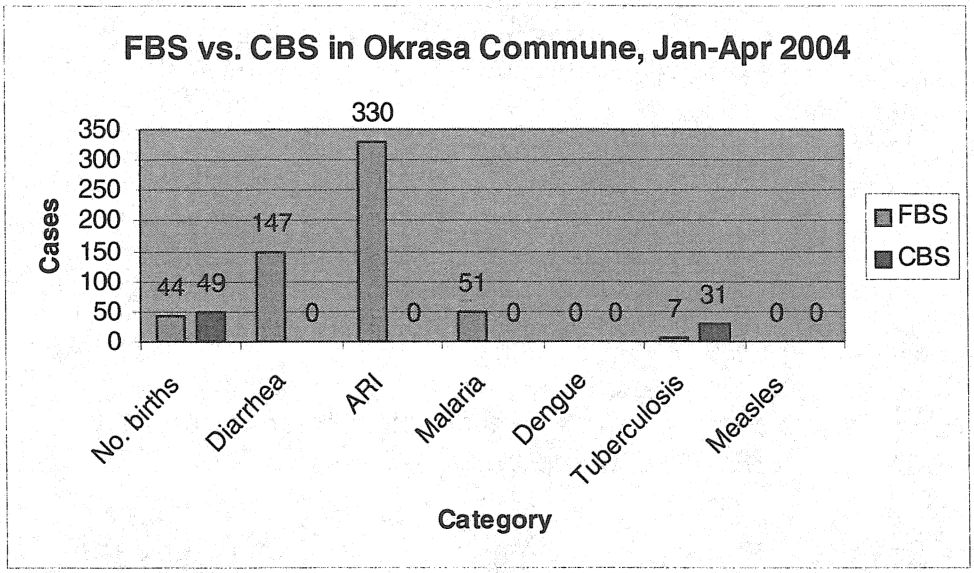

Figure 10.

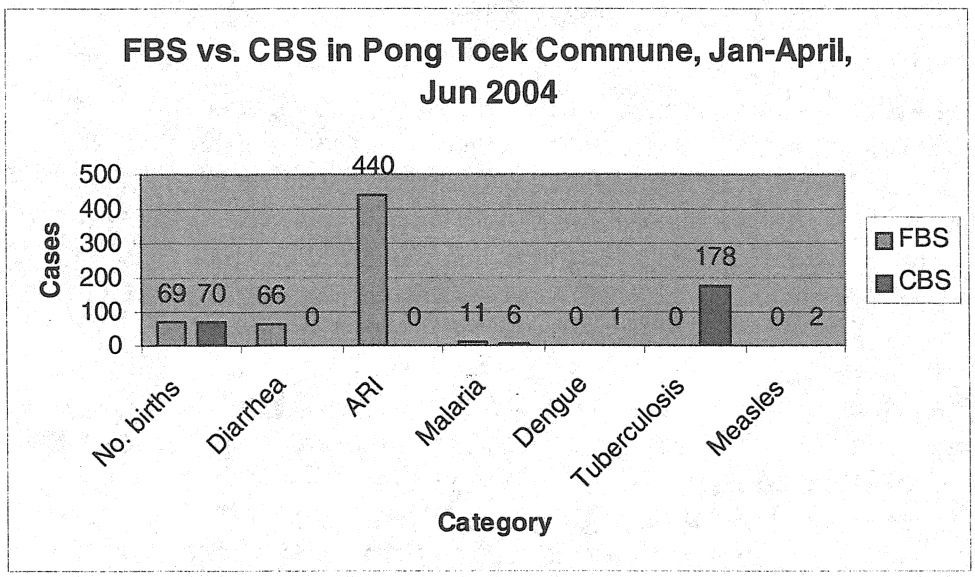

Figure 11.

8 Discussion

8.1 No. births

The crude birth rate by CBS in Kep was far greater than the national figure but was close to the data found by FBS. The disparity between the local and national data might be as a result of a difference between rural and urban birth rates, where rural families tend to be larger. Since the CBS data was close to the FBS data, it is likely that the CBS data is accurate.

Nevertheless, there are several possible explanations for the small differences observed in the FBS and CBS data. For instance, it is unclear in both the FBS and CBS whether the 'number of births' category included stillbirths in addition to live births. When this was investigated, a three RCVs and the OS HC director reported that only live births were counted in this category. Therefore, this does not explain the discrepancy: in both communes, the CBS recorded more births. Therefore a more likely explanation may be that the FBS did not detect as many births that occurred outside of the HC as the CBS did. For instance, the RCVs may have more contact with the TBAs in the community and with the mothers who do not seek antenatal or post-partum care in the public system.

8.2 No. deaths (<5)

The child mortality rate in Kep was found to be 78 per 1000 live births, lower than the national rate of 124. However, given that the CBS rate was calculated based on ten time points, and was not subject to any statistical testing, the significance of this result is questionable.

8.3 Total deaths

The mortality rate in Kep by CBS was far higher than the national rate, and no FBS data was available for a local comparison. Kep is a poor province and under-resourced compared other areas of the Cambodia. Therefore it is likely to have poorer health indicators than the national average.

8.4 Diarrhea

When the CBS data was compared to national incidence and FBS data counting cases of diarrheal disease, the difference was profound. Firstly, the incidence rate calculated by CBS was an order of magnitude less than the national incidence. Secondly, over the months of comparison, the CBS reported no cases of diarrhea and the FBS reported over 50 cases at each HC. This is reason to doubt the validity of CBS data. Another reason that the incidence of diarrhea in Kep is unlikely to be as low as reported by CBS is that the percentage of the population with access to safe water and adequate excreta disposal facilities is lower in rural areas than in urban areas (WPRO). If anything, the incidence of diarrhea in rural areas is likely to be higher than the national average of 2,366 cases per 100,000 people.

The low incidence of diarrhea in the villages reported by CBS may have been due to villagers only reporting current cases of diarrhea, only when specifically asked, and only during the infrequent visits. Since homes were often visited less than once a month, and sometimes never at all, it is unsurprising that villager recall of resolved cases of diarrhea might be low; even the RCVs suspected this. Furthermore, asking specifically whether there has been any diarrhea in the household might elicit a more accurate response than asking more generally whether there has been any illness. Many RCVs report only asking a general question like, "has there been any illness?" On the other hand, FBS may detect more diarrhea cases because those same villagers might bypass the RCVs and visit the HC directly during the course of their illness. To improve case detection, RCVs may have to visit a given home more

often and ask specifically about past and present diarrhea. Also, as the capacity and reputation of the RCVs builds in the community, the villagers will be more likely to approach the RCVs when they fall sick.

8.5 Acute Respiratory Infections (ARI)

Much like with diarrhea, CBS recorded considerably few cases of ARI when compared to national data and FBS. Although the translation of the term ARI may have been a barrier, few of the RCVs recognized ARIs, or even considered chronic cough as separate from TB. Therefore, it is unsurprising that nearly no cases were reported by CBS. On the other hand, ARIs were the leading cause of morbidity and the second leading cause of mortality in Cambodia in 2000 (WPRO). Clearly, the health impact is large. Therefore the inaccuracy of this CBS category and the burden of this group of illnesses require that significant steps be taken to improve the CBS.

8.6 Malaria

More cases of malaria were reported by FBS than CBS, and a higher rate by CBS than from WPRO. An explanation for the difference between FBS and CBS could be the combined effect of infrequent home visits and lack of knowledge and experience on the part of the RCVs. The latter may be especially relevant because malaria has no cardinal signs or symptoms. Fever, chills and fatigue are relatively non-specific. As with diarrhea, villagers, upon falling ill, likely bypassed the RCVs, presented to the HC, were diagnosed with malaria at the HC, and were counted in FBS only.

The difference between the CBS and WPRO data could be trivial or significant. It could be trivial because the CBS data did not undergo statistical testing and the rate of malaria incidence was derived by normalizing ten months of data. On the other hand, the high rate of malaria found by CBS could indicate that there is more malaria in rural areas or simply that Kep is an area with high incidence of malaria.

8.7 Dengue

The normalized dengue incidence rate extrapolated from ten months of CBS data was much higher than the WPRO national rate. Again, value of comparing the CBS with WPRO may be little because there are too little data representing too small a population. Furthermore, the cases reported by CBS came from only four of the seven villages.

On the other hand, the CBS and FBS data correlated well and showed few cases. As discussed above, the low number of cases could be a function of the low numbers of dengue vector mosquitoes in rural Kep over the months used for comparison. For example, 13 of the 16 total cases occurred in May/June 2003, a month not included in the CBS vs. FBS analysis. Conversely, it is possible that both the CBS and FBS are not sensitive enough and cases are being missed. The interviews and focus groups revealed that the RCVs have been taught that only children are susceptible to dengue in their training, meaning that adult cases may have not been identified by CBS.

8.8 TUBERCULOSIS

This data category posed the most challenges for data analysis. In this category, the RCVs have been trained to count cases of chronic cough lasting over 21 days. However, because RCVs had difficulty recalling this number, and because they may have made errors or approximations when counting days of cough, some of the CBS cases of TB may have actually been misclassified cases of ARI. This hypothesis is also plausible considering the obvious disparity in ARI cases recorded in FBS and CBS (see Figure 10, Figure 11). Nevertheless, a few misclassified cases of ARI do not account for the dearth of ARI cases recorded by CBS.

In the case of TB, the comparison of CBS and FBS data proved fruitless. The HC director at OS reported that the FBS monitors new cases of suspected TB and does not gather prevalence data. This is a problem that has already been recognized by the Red Cross. Making a comparison between CBS data and national figures was also difficult. Since CBS data do not take into account new or resolved cases of cough, they must strictly be considered as monthly prevalence. Unfortunately, the available data for Cambodia tends to be in terms of annual prevalence. Therefore, again the comparison is not useful.

That making comparisons was problematic does not automatically invalidate the CBS data. In the past, the HCs were not equipped to diagnose and treat TB. Training in DOTS (directly-observed treatment shortcourse) has just begun at the HCs in July 2004. Therefore, the referral hospital has been the only place for diagnosis, treatment, and follow-up in Kep within the public system. If the villagers were aware of this, they may have sought treatment directly at the hospital, bypassing the HC and hence FBS. Alternatively, they may have sought treatment at private pharmacists and clinics or traditional healers.

Furthermore, the consistency of the CBS data over time supports the notion that the RCVs collect prevalence data. Consistency implies chronicity, suggesting that the RCVs effectively recognized cases of presumptive TB. Also, the RCVs report counting all cases, not only new ones. For example, all of the data available from PL in Pong Toek commune ranges from 25 to 31 cases per month. The standard deviation is less than 2 in 5 of the 7 villages, OS and RN being the exceptions (see Table 9).

Therefore, the CBS data on presumptive TB have some inherent value. The capacity for data collection can be improved with increased training on TB and ARI. To make the CBS data more amenable to comparison, the RC should reconsider exactly how to collect data about TB. Any changes should take into consideration the capacity of the RCVs in terms of time, compensation, knowledge, and record-keeping.

Village	Standard Deviation
OS	5.165054
DC	1.178511
PL	1.897367
CB	4.148628
OD	1.135292

RN	4.228212
PK	1.286684
Total	8.192815

Table 9. Standard deviation of TB cases counted by CBS over all months of available data.

8.9 Measles

There was little CBS data on measles from which to make observations, since data has only been collected since February 2004 and only four time points were available for this study. For this reason, the incidence rates extrapolated from the CBS data are an inaccurate approximation of an annual measure; hence, a comparison with WPRO data is not particularly insightful.

The comparison of case numbers found in FBS and CBS is much more valid; however as with the other categories, there were only four or five time-points available for investigation. Marginally more cases were detected by CBS than by FBS (see Figure 10., Figure 11.). The difference could have been a result of misclassification by the RCVs or a result of the traditional Khmer practice of keeping children with measles at home, as discussed earlier.

8.10 Overall Observations

8.10.1 CBS vs. National Data

This type of comparison can be valuable because it provides insight about regional variation in health status. However when region-specific data are not available, comparison with national data also provides a general impression of the CBS validity. For this study, the Cambodian incidence and prevalence data used were given by the year. On the other hand, the data from CBS are collected monthly and only ten non-consecutive time-points were available. Also, the population from which the CBS data were drawn was about 2762, several orders of magnitude smaller than the population of Cambodia. For the purposes of comparison, the CBS data were normalized by averaging the values from ten months and multiplied by twelve. A similar procedure was undertaken for measles, where only four time-points were available. Clearly, this conversion lacks statistical rigour and it limits the extent to which conclusions can be drawn from this comparison.

Another limitation of this comparison was the temporal origins of the data. Most of the national rates used were measured about three years before the RCV program and hence the CBS were created. However, this could not be avoided, as there is an inevitable latency period between the collection and the release of national data which does not apply to CBSS.

However, in some cases the differences observed were too large to ignore. The calculated incidences of diarrhea and ARI were remarkably low compared to the national data. Furthermore, the direct comparison with FBS revealed the same discrepancy. This casts doubt on the validity of the CBS data in these categories. The poor level of ARI knowledge and low frequency of home visits are more reasons to be skeptical. Therefore despite the crudeness of the calculations, there is convincing evidence from both comparisons and

the qualitative component of this study that point to an underreporting of ARI and diarrhea.

8.10.2 CBS vs. FBS Data

The availability of data obtained from the same population over the same time period as the CBS provides an ideal basis for comparison. The FBS data is collected by health centre staff who have more training and experience than the RCVs. Therefore it is reasonable to assume that the FBS data are specific and representative of a baseline of data. The ideal CBS would be sensitive and specific, such that the case numbers should be near or above the FBS values.

Statistically, there is no concern over the sample size of the population or the rigour of normalization because the FBS data was also collected monthly. Due to time constraints, only the FBS data from 2004 was obtained from the HC. Therefore this comparison may not be statistically significant because only four or five months of data were compared.

Nevertheless, this comparison proved to be useful. Firstly, it was interesting to note that the same pattern was observed at each HC. Given the geographical proximity and socioeconomic parallel of the communes, and given that the HC staff and RCVs in each commune received similar or identical training as their counterparts, this result is not surprising. Secondly, the difference in some categories was too obvious, as with the CBS comparison to national data. This is especially convincing when the differences observed in this comparison corroborates with the comparison against national data and with the anecdotal evidence from the RCV interviews.

9 RECOMMENDATIONS

The Red Cross Volunteer Program in Kep is an ambitious community participation program with components of community-based first aid, health education, referral to the health centres and referral hospital, and community-based surveillance system. Many aspects are working very well and the Cambodian Red Cross should be commended for their efforts. Nevertheless, there is always room for improvement. It is the hope of the investigators that the Red Cross will find some of the following recommendations useful in their continuing development of the program.

9.1 INCREASING THE CAPACITY OF THE RCVS

Time is a constraint for many of the RCVs because they are expected to perform many skilled duties in addition to their normal occupations. Several possible solutions exist that will reduce the burden of responsibility on the RCVs.

- **Train more villagers to become RCVs.** The assistants to the RCVs could make good candidates. Subsequently, the RCVs could subdivide into smaller groups within each village. Home visits and health education could be done in these small groups, if doing so gives the RCVs more confidence. Alternatively, the small groups could specialize in a particular task, such as health education or first aid. They could receive

supplementary training and devote most of their volunteering time to that task.

- **More training for RCVs.** This includes not only new topics, but review of topics that have been previously discussed. For instance, the RCVs know very little about ARI and this is reflected in their low case finding of these illnesses. Also, the RCVs should be taught to ask villagers for specific symptoms to improve the sensitivity of the CBSS.
- **Increased compensation.** One RCV said that his wife curses him for volunteering because there's no money in it. While all the RCVs expressed noble reasons for volunteering, the per diem they are receiving is meagre, and likely holding them back from doing more.

9.2 Prioritization of RCV Activities

The suggestions above may not be realistic for the Red Cross as they also have resource constraints. Therefore an alternative solution is to prioritize the components of the RCV program and to focus on these parts, using the same number of RCVs with the same salary.

- **Reconsider CBSS.** The RCVs do not have the time, money, or knowledge to perform CBSS to its full potential. One of the most labour-intensive parts of being a RCV is simply traveling from home to home, and case-identification is highly-skilled work. If it is not possible to address those constraints, the RC could instead reevaluate the relevance of doing CBSS.
- **Focus on health education.** The RCVs considered health education to be very important. Given that the knowledge required to do HE is broad but less complex than for CBSS, this is a feasible and valuable area of focus. Since the RCV prefer to do HE by home visit, they could continue to make referrals to the HC or referral hospital.

9.3 Defining Standards for the RCV Program

The variation in program implementation between and within villages was shocking and needs to be addressed. Standardization of RCV parameters will ensure that the data collected, education provided and referrals made are more reliable. There are many possible approaches.

- **Set a quota of homes to visit.** Each RCV is required to visit a specified number of homes each month.
- **Set a quota of frequency of home visits.** The RCVs, individually or in groups, must ensure that each home is visited a given number of times.
- **Set a quota of days for home visits.** The RCVs are required to spend a given number of hours or days doing home visits.
- **The composition of the home visits team.** This includes home visits for CBSS and after hearing that a villager is ill. The role of the assistants should be defined to exclude doing this task alone. The Red Cross should decide how many RCVs should visit together. The smaller the number, the greater the coverage can be. However, larger groups have the advantage of pooled knowledge. This could be addressed by having increased training, as discussed earlier.

- **The location for HE.** RCVs have expressed a preference for doing HE home-by-home. They believe it is advantageous because they are able to examine the condition of the home. However, it is much less efficient than gather the villagers into a large group.
- **Coordination with the HC to do HE at community clinics.** The MoH MPA (minimum package of activities) mandates that the HC staff should do community outreach in the form of community clinics. This is currently not a reality; however, when the capacity of the HC is increased in the future, the RCVs should capitalize on the crowd by doing HE at the same time.